we have even been obliged to admit that Muskarin is obtained from *Amanita muscaria*.[1] But now Dr. Zellner has a further shock for us, and we find such words as *Kalzium, Zitronensäure, Glyzerin, Azetyl*, &c., scattered throughout his pages. Thus (p. 97) Mykose forms an "*Oktoazetylverbindung*," which is no doubt chemically true, but, stated in this form, it seems to jar upon the orthographic nerve of the average English reader. All this is, of course, purely personal, perhaps old-fashioned or narrowly insular, and has nothing to do with the scientific merits of the work, which, as has already been said, are of a very high order, and every worker in the domain of plant chemistry will be grateful to the author for having produced it.

R. MELDOLA.

BOTANICAL INSTRUCTION.

Plant Biology. A Text-book of Elementary Botany arranged for Modern Methods of Teaching. By Dr. F. Cavers. Pp. xvi+460. (Cambridge: University Tutorial Press, 1907.) Price 3s. 6d.

Laboratory and Field Manual of Botany. By J. Y. Bergen and B. M. Davis. Pp. viii+257. (Boston and London: Ginn and Co., n.d.) Price 4s. 6d.

Studies in Plant Life. By J. Adams. Pp. v+179. (Dublin and Belfast: Fallon and Co., Ltd., n.d.)

Elementary Botany. By M. A. Liversidge. Pp. 128. (London: Blackie and Son, Ltd., 1907.) Price 1s. 6d. net.

Introduction to Elementary Botany. By Charlotte L. Laurie. Pp. viii+84. (London: Allman and Son, Ltd., n.d.) Price 1s. net.

Our Woodlands, Heaths and Hedges. By W. S. Coleman. Pp. viii+141; with 8 plates. New edition, entirely reset. (London: George Routledge and Sons, Ltd., 1907.) Price 1s.

THE advocates of an exclusively experimental course of study in the natural sciences are confronted with the difficulty of time limitations, so that in practice it becomes necessary to strike a balance between lecture and practical work. Dr. Cavers has indicated in "Plant Biology" the lines of work that he has found successful with training-college students, in which the training is almost entirely derived from observation and experiment. The foundation of the course consists of experiments—of which about three hundred and fifty are outlined—in connection with the nature and function of parts of the flowering plant; so far as possible the bean plant is used as the type. Flower and soil, biology and ecology provide a subsidiary section. The course differs mainly from ordinary practice in excluding the examination of selected types from the main groups and in the general omission of flowerless plants. With regard to the composition of the subject-matter, the author deserves great commendation; the arrangement is well planned, the experiments are generally simple and practicable, and the information is contrived to make the student

[1] The familiar *Chemisches Central-Blatt* has now become a *Zentral-Blatt*.

think. A series of questions at the end of each chapter can be used either by the student or his instructor to gauge the progress that is being made. The appendices also contain much useful matter; hints on practical work refer to special opportunities afforded month by month; a summary of Engler's system of classification is provided, and a glossary of botanical terms.

The manual prepared by Mr. Bergen and Dr. Davis is a practical handbook primarily arranged in accordance with their text-book "Principles of Botany." The first part relates to the structure and physiology of seed plants. The plan adopted of outlining the instructions without detailed information that is left for the student himself to discover is good, but the authors have not been very happy in distinguishing between more and less important facts or in systematising the subject-matter. As an instance, it may be cited that the description of a typical young dicotyledonous stem is not particularly noted, while the structure of the climbing dicotyledonous stem receives undue prominence. The second part, indicating type studies of flowering and flowerless plants, is more felicitous. Spirogyra forms a suitable introduction for studying the cell in detail. Pleurococcus, Vaucheria, Ulothrix, and Œdogonium are chosen as the types of green algæ, while reference is also made to Ulva, Cladophora, and Coleochæte. Microsphæra, the lilac-mildew, is selected as the type of an Ascomycete, and the introduction of Marsilia is quite a desirable innovation. Ecology is dealt with in the third section under the headings of flower pollination, seed dissemination, types of vegetation, &c. The remainder of the book is devoted to accessory but valuable hints on reagents, methods of fixing and staining, cultures of the lower plants, and apparatus. Considered as a whole, the authors have provided a useful manual that presents a large amount of practical information in a limited amount of space.

The small book written by Mr. Adams is of an extremely superficial nature. Owing to generous spacing and a large number of illustrations, the text is less than would be expected. In the circumstances, it would have been advisable to give more space to the essentials of plant structure as exemplified in the flowering plant and to have omitted the cursory descriptions of flowerless plants and plant habitats. The author has taken pains to introduce facts of practical importance to the agriculturist, such as fertilisers, dwarf shoots, &c., but there is a lack of clearness and accuracy in some of the elementary definitions.

The limits of Miss Liversidge's book are set by the intention of covering the syllabus of work for the Oxford and Cambridge junior local examinations. It is evident that it has also been written rather with the view of giving facts for examination purposes than of training the young mind. There are four parts, assigned to external morphology, anatomy, physiology, and systematic botany. The design of the physiological part is good, but the experimental

instructions could be materially improved. The anatomical facts are clearly stated considering that this part of the subject is much more advanced than the rest of the book. But speaking generally, the author has aimed at brevity, and in so doing has sacrificed exactness; this is specially noticeable in the course of external morphology, where several mistakes and incomplete definitions occur.

The short introduction to elementary botany planned by Miss Laurie is a direct antithesis to the last, as the facts recorded are few, but they are deduced or suggested so as to arouse interest and stimulate experiment and thought. Written primarily for quite small children, it shows how facts in the life-history of plants may be taught from simple experiments, such as the growth of mustard seeds in a bottle In addition to morphology and the accompanying physiology, there are chapters on interrelation between plants and animals, climbing plants and colours of plants. Although the information is couched in a form understandable by young children, the book could be advantageously adopted as a first course for older children, and might be profitably consulted by many teachers as a guide to imparting instruction.

The observation of trees and shrubs is preeminently suited for a nature-study class, and possesses the advantage that there is much to be noted even during the winter months. A short, concise manual or primer at a modest price is an existing desideratum. The volume written by Mr. Coleman compasses the subject and certainly sells at a modest price, but it fails to satisfy the want alluded to. The author has culled much interesting information of a general and historic nature, but there is an almost entire absence of the numerous botanical features of interest, such as winter buds, arrangement of leaves, &c., and for identification the reader is mainly dependent upon the illustrations. The notes on animals and insects haunting the various trees and shrubs are so useful that one wishes the author had given more space to these facts of natural history. A list of British lepidopterous insects the caterpillars of which feed on certain plants is provided in an appendix.

APPLIED MATHEMATICS.

(1) *Computation and Mensuration.* By P. A. Lambert. Pp. ix+92. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1907.) Price 3*s.* 6*d.* net.

(2) *A First Statics.* By C. S. Jackson and R. M. Milne. Pp. viii+380. (London: J. M. Dent and Co., 1907.) Price 4*s.* net.

(3) *Practical Calculations for Engineers.* By C. E. Larard and H. A. Golding. Pp. xiii+455. (London: C. Griffin and Co., Ltd., 1907.) Price 6*s.* net.

(1) THE author says that the boys in the secondary schools of America are not taught to apply their mathematics independently, and consequently find, on entering college, that they have difficulty in making effective use of their theoretical knowledge, and this book is intended as a link between the school and college courses, to be studied either at the end of one or the beginning of the other.

The same deficiency is manifest in boys leaving our schools, and in this country is being met by improved teaching combined with practical work in the laboratory, as a regular part of the school course.

The book is admirably planned and written, is concise, neat in method and interesting, and meets a real want in a worthy manner. It begins with examples of direct measurement, approximate numbers, and contracted arithmetic, estimating the degree of accuracy by the number of decimal places; perhaps the number of significant figures would have been better. This is succeeded by examples of practical geometry, including the construction and measurement of triangles, and some squared-paper work. Then follows the volume of a prismatoid, and in later chapters on mensuration it is shown that the prismoidal formula, or Simpson's rule, is widely applicable. There is a useful chapter on trigonometrical computation, introducing very appropriately the notion of a vector with examples of vector summation. Logarithms and the slide rules are next considered, followed by an interesting chapter on limits, illustrated by several important convergent series. The author always seizes on the salient points, is never prolix, and the interest never flags; in each chapter the student is well started on his way, then provided with good and suggestive examples, and wisely left to his own resources. Thus, although the pages of the book are comparatively few, the usual ground is covered, and a thorough and efficient training in practical computation is provided. English teachers would do well to consult this work.

(2) This text-book proceeds on easy lines, and the student is provided with a wealth of examples at every stage from which to choose, the answers being collected at the end of the volume. In their scheme the authors have considered " the historical order of development of the subject, as indicating almost infallibly the line of least resistance." Thus in the first chapter the principle of the lever is introduced, and the law of moments for parallel forces is established by simple experiments, then illustrated by examples of ancient and modern steelyards and balances, and finally applied to find the conditions of equilibrium of three parallel forces in a plane. The next two chapters deal with the parallelogram law for forces at a point, the treatment being here again, as always, experimental, graphical, and analytical, with examples of useful applications in the arts. It is not quite clear why the authors should substitute the term "geometric" addition for *vector* addition, or why arrow-heads should "sometimes" instead of *always* be inserted in vector diagrams. In chapter iv. the principle of moments is again considered, being now deduced from that of the parallelogram and applied to couples. Then follow sections dealing with machines, friction, and centres of